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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/763,800	01/24/2004	Larry S. Eoff	2003-IP-009464U1	1654
<div>7590      07/24/2007</div> <div>Robert A. Kent Halliburton Energy Services 2600 South 2nd Street Duncan, OK 73536-0440</div> <div>EXAMINER FIGUEROA, JOHN J</div> <div>ART UNIT      PAPER NUMBER</div> <div>1712</div> <div>MAIL DATE      DELIVERY MODE</div> <div>07/24/2007      PAPER</div>				

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/763,800

Applicant(s)

EOFF ET AL.

Examiner

John J. Figueroa

Art Unit

1712

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 27 April 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-5, 10-14, 21, 24-29, 100-106, 108-127 and 129-149 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5, 10-14, 21, 24-29, 100-106, 108-127 and 129-149 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date April 16, 2007.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Response to Amendment*

1. The 35 U.S.C. 102(b) rejection of **claims 1-5, 10, 12, 14, 21 and 24-29** as anticipated by United States Patent Number (USPN) 4,532,052 to Weaver et al. (hereinafter 'Weaver') previously made of record in item 6 on page 3 of the Office Action mailed March 5, 2007 (hereinafter 'OA') has been withdrawn.
2. The 35 U.S.C. 102(b) rejection of **claims 106, 108-111, 117, 119, 120, 123-127, 129-132, 138, 140, 141, 144 and 145** as anticipated by Weaver has been maintained for reasons previously made of record in item 6 on page 3 of OA.
3. The 35 U.S.C. 103(a) rejection of claims 11-14, 116-119 and 137-140 as unpatentable over Weaver in view of USPN 6,358,889 B2 to Waggenspack et al. (hereinafter 'Waggenspack'), previously made of record in item 8 on page 7 of OA, has been withdrawn.

### *Election/Restrictions*

4. A restriction requirement and an election of species had been presented in item 3 of OA. Applicant had elected Group I, claims 1-5, 10-14, 21, 24-29 and 99-145 that were drawn to a method of performing an injection operation including introducing a relative permeability modifier (RPM) comprising a hydrophobically modified water-

Art Unit: 1712

soluble polymer, classified in class 507, subclass 110. New claims 146-149 have been included in this group and thus considered in the instant Office Action.

5. An election of species for the hydrophilic polymer was required (items 7-8 of the Office Action of 3/23/2006) and Applicant elected, without traverse, "chitosan" as the species to be examined. However, the chitosan species has been found to be a potentially allowable species (if claim 1 is rewritten to include the limitations discussed below). For purposes of this Office Action, previously non-elected species including polyamine, polyetheramine, polyethyleneimine, polyhydroxyetheramine, vinyl amine, alkylamino, alkyl (meth)acrylate and polydimethylaminoethyl methacrylate have been examined. Thus, previously withdrawn claims 100-105, 112-115, 121, 122 and 133-136 have been reintroduced into the application and thereby examined.

### ***Claim Rejections - 35 USC § 103***

6. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

7. Claims 1-5, 10-14, 21, 24-29, 100-106, 108-127 and 129-149 are rejected under 35 U.S.C. 103(a) as unpatentable over Weaver in view of United States Patent Number (USPN) 3,271,307 to Dickson et al. (hereinafter 'Dickson').

Weaver was discussed previously in item 6 in OA and the arguments and grounds of rejection are repeated herein for Applicant's convenience.

Weaver discloses a method for fracturing, and/or diverting fluids within, a subterranean formation to substantially alter the fluid flow (permeability) and/or surface

characteristics of the formation, said method including injecting into the formation an aqueous composition that can alter the properties of organic/aqueous fluids, said composition containing a branched water-soluble organic polymer containing unit(s), having a molecular weight of 900 to 50,000,000, that can be hydrophilic, hydrophobic or a combination thereof, and can further include a gelling agent and/or a proppant.

(Abstract; col. 5, lines 1-10 and 30-65; col. 6, lines 29-65; col. 7, lines 7-33; col. 9, lines 32-37 and 49-63; col. 20, line 65 to col. 21, line 6; col. 21, lines 49-63; col. 38, lines 37-51; col. 39, lines 24-36; *See particularly*, col. 8, lines 41-67; *See also*, Table 6 on col. 53-54 disclosing data of aqueous fluid diverting and water permeability reduction properties for an aqueous fluid containing a methoxypolyethylene oxide branched polydimethylaminoethyl methacrylate copolymer, sand, silica flour and bentonite)

For example, an exemplary polymer disclosed in Weaver for treating subterranean oil producing formations has a cationic hydrophilic backbone modified with hydrophobic branches providing a desired hydrophobic-hydrophilic within the formation, thus altering the surface characteristic of the formation and the fluid flow or resistance to flow relative to a particular fluid, wherein the hydrophilic nature of the branched polymer serves as an aqueous gelling agent that provides for an increase in fluid viscosity. (Col. 5, lines 11-16; col. 6, line 65 to col. 7, line 40; col. 7, line 63 to col. 8, line 21; col. 10, lines 56-59; Table on col. 9-10) In Tables 23-28, Weaver discloses data for examples of treating a well by injecting into the well an aqueous solution containing a cationic polymer with nonionic branches.

Art Unit: 1712

Weaver discloses that the water-soluble branched polymer can have, in its backbone chain and/or in its branch chain, one or more heteroatom or groups, such as nitrogen, oxygen, phosphorous, sulfur, sulfur groups, amide, carboxyamide and carbonyl. (Col. 14, lines 17-23 and 52-59) The polymer units in either chain can be  $-R-X-$ , wherein R is a  $C_1$  to  $C_6$  alkyl radical and X represents a heteroatom and are preferably capped. (Col. 19, lines 36-65) Particularly, branched polymers containing polyamine and polyether linkages in the branches are preferred for altering fluid flow properties in the formation and are especially effective and stable at temperatures above  $177^{\circ}\text{C}$ . (Col. 13, lines 1-18)

Among the monomers disclosed in Weaver that can be used to form the branched polymer include dimethylaminoethyl methacrylate, acrylic esters, acrylamide, epichlorohydrin and chloroprene; wherein the polymeric unit/group can be derived from, e.g., saccharide or a derivative thereof (including cellulose and starch), vinyl, diallylic, amide or ether monomeric units, as long as it has the desired hydrophilic-hydrophobic property. (Col. 19, lines 7-10; col. 19, line 66 to col. 20, line 29; col. 22, lines 47-65) The vinyl or diene polymer units are represented by (Class I, structure on col. 23); the amine type polymer units (Class III, structure on col. 24-25); the amide type polymer units (Class IV, structure on col. 25); whereas the saccharide and saccharide derivative units (Class V) are represented by the chemical structure depicted on col. 25-26, lines 43-59. (See *also*, the examples of class V on col. 35-36)

Weaver further discloses that a preferred class of polymers for altering aqueous fluid properties, such as altering water-oil ratio in a formation process and enhancing oil

Art Unit: 1712

production, are polymers containing 2-hydroxypropyl N,N dialkyl-amine as backbone units and acrylamide (organic acid derivative) and/or epichlorohydrin reacted polyalkoxide as the branch units. (Col. 42, lines 31-37) In Procedure O beginning on col. 50, line 5, Weaver discloses an example of altering the permeability of a formation surface (change in water-oil ratio) by injecting into the formation a copolymer of polydimethylaminoethyl methacrylate (PDMAEM having MW of 1 million) grafted with a polyethylene oxide branch (PEO, MW of 15,000). The resulting data showing reduction in water permeability of the formation is shown in Tables 7 and 8. (See *also* Tables 10-13 on col. 57-59 for permeability data of an aqueous treating solution containing 1% of a hydrophilic PDMAEM polymer (MW of 600-800K) branched with a hydrophobic methoxy-polyethylene glycol epichlorohydrin (MPEO) adduct; particularly, polymer #7 of Table 10). In Tables 14-15 on col. 59, Weaver further discloses PDMAEM:PEO/MPEO weight ratios for the branched polymer ranging from 0.5:1.0 to 1.25 to 0.25.

Regarding the limitation in independent claims 1, 106 and 127 concerning the hydrophobically modified water-soluble polymer reducing the permeability of the subterranean formation to an aqueous-based fluid, Weaver discloses results demonstrating reduction in water permeability in the same examples containing the modified polymer discussed above (immediately preceding paragraph) in Tables 10-13 and 14-14 on col. 57-60. (See, *e.g.*, Sample #7 on Table 10, showing a reduction in water permeability of 85%)

Finally, regarding the limitation in claim 125 concerning "metering" the RPM into an injection stream comprising the aqueous injection fluid, in the absence of guidance

Art Unit: 1712

from the specification, the term "metering" has been given its broadest interpretation as another term for "providing" the RPM to the well via injection, which is encompassed by Weaver as discussed above.

However, Weaver does not expressly disclose the RPM to have the alkyl branch recited in claim 1, as amended.

On the other hand, Dickson teaches branched polyalkylene polyamines used as oil well treatment composition additives (e.g., as demulsifiers or corrosion inhibitors), said branched polyamines having a polyamine base (or derivative thereof) hydrophilic polymer and an alkylene branch that can be butylenes and other homologs, straight-chained or branched. (Col. 1, lines 13-50; col. 2, line 16 to col. 3, line 5) These compounds can undergo acylation (to form, e.g., acrylate or methacrylate derivatives) or be reacted with an alkenyl succinic acid derivative (col. 3, lines 50-68; col. 5, lines 8-55; col. 6, lines 43-73); and/or they can undergo alkylation/oxyalkylation with, e.g., an alkylating agent, butylenes oxide or octylene oxide, or (col. 10, lines 1-16; col. 15, lines 56-66; col. 19, lines 25-59; col. 24, lines 39-53; Table II; Examples 1-3).

Dickson further teaches that these branched compounds have numerous uses in processes involving water flooding in a subterranean formation and have advantages, such as not forming precipitates, good anti-corrosion properties and having strong bactericidal action. (Col. 31, line 72 to col. 32, lines 39)

Therefore, it would have been obvious to a person of ordinary skill in the art at the time that the invention was made to use the branched polyamine compounds as the hydrophobically modified hydrophilic polymer injected in Weaver's method of treating a



Art Unit: 1712

subterranean formation. It would have been obvious for one skilled in the art to do so to attain a more cost-effective oil treatment method using a resultant aqueous fluid having the enhanced anti-corrosion, bactericidal and non-precipitation properties taught by Dickson, and thus efficiently attain a desired level of surface permeability of the subterranean formation.

Thus, the instant claims are unpatentable over Weaver and Dickson.

### ***Allowable Subject Matter***

8. Claim 1 would be allowable if rewritten to limit the hydrophilic polymer to contain the chitosan species that was previously examined. The prior art of record (including Weaver) does not teach or suggest a method of performing an injection operation that includes adding an RPM containing the hydrophobically-modified hydrophilic polymer recited in claim 1, as amended, wherein the hydrophilic polymer comprises chitosan.

### ***Response to Arguments***

#### ***The 35 U.S.C. 102(b) Rejection over Weaver (item 6 of OA)***

8. Applicant's arguments presented in the "Remarks" section of the response to OA filed on April 16, 2007 (hereinafter 'Response') regarding the 35 U.S.C. 102 rejection as anticipated by Weaver have been considered and deemed persuasive as to Weaver not disclosing the hydrophobically modified hydrophilic polymer recited in claim 1, as amended. Thus, this rejection has been withdrawn.

*The 35 U.S.C. 103(a) Rejection over Weaver and Waggenpack (item 8 of OA)*

9. Applicant's arguments presented in the "Remarks" section of Response regarding the captioned 35 U.S.C. 103 rejection as unpatentable over Weaver in view of Waggenpack have been fully considered but deemed moot due to the withdrawal of the rejection in favor of the new grounds of rejection.

***Conclusion***

10. Applicant's submission of an information disclosure statement under 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p) on April 16, 2007 prompted the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 609.04(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to John J. Figueroa whose telephone number is (571) 272-

Art Unit: 1712

8916. The examiner can normally be reached on Monday-Thursday 8:00-6:00pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on (571) 272-1302. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JJF/RAG



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